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HOUSE OF REPRESENTATIVES
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No. 156

CHARLESTON HARBOR, S. C.

LETTER

FROM

THE SECRETARY OF WAR

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, UNITED STATES ARMY, DATED JANUARY 23, 1941, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND AN ILLUSTRATION, ON REEXAMINATION OF CHARLESTON HARBOR, S. C., REQUESTED BY RESOLUTION OF THE COMMITTEE ON RIVERS AND HARBORS, HOUSE OF REPRESENTATIVES, ADOPTED FEBRUARY 16, 1940

March 27, 1941.—Referred to the Committee on Rivers and Harbors and ordered to be printed with an illustration

War Department,
Washington, March 25, 1941.

The Speaker of the House of Representatives.

Dear Mr. Speaker: I am transmitting herewith a report dated January 23, 1941, from the Chief of Engineers, United States Army, on reexamination of Charleston Harbor, S. C., requested by resolution of the Committee on Rivers and Harbors, House of Representatives, adopted February 16, 1940, together with accompanying papers and illustration.

The Bureau of the Budget has been consulted and advises that authorization of the project recommended by the Chief of Engineers would not be in accord with the program of the President at this time.

Sincerely yours,

Henry L. Stimson,
Secretary of War.

War Department,
Office of the Chief of Engineers,
Washington, January 23, 1941.

The Chairman, Committee on Rivers and Harbors,
House of Representatives, Washington, D. C.

My Dear Mr. Chairman: 1. The Committee on Rivers and Harbors of the House of Representatives, by resolution adopted February 16, 1940, requested the Board of Engineers for Rivers and Harbors to review the reports on Charleston Harbor, S. C., submitted in House Document No. 249, Sixty-ninth Congress, first session, and previous reports, with a view to determining whether it is advisable to modify the existing project in any way at this time. I enclose the report of the Board in response thereto.

2. After full consideration of the reports secured from the district and division engineers and after affording local interests full opportunity to be heard, the Board recommends modification of the existing national-defense project for Charleston Harbor, S. C., to provide an anchorage area 30 feet deep in the water area between Castle Pinckney and Fort Moultrie, substantially in accordance with the plan of the district engineer for area B–1, at an estimated first cost of $1,820,000, with $12,500 annually for maintenance, in addition to the amounts now authorized.

3. After due consideration of these reports, I concur in the views and recommendations of the Board.

Very truly yours,

J. L. Schley,
Major General,
Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

War Department,
The Board of Engineers for Rivers and Harbors,
Washington, D. C., December 2, 1940.

Subject: Charleston Harbor, S. C.
To: The Chief of Engineers, United States Army.

1. This report is in response to the following resolution adopted February 16, 1940:

> *Resolved by the Committee on Rivers and Harbors of the House of Representatives, United States,* That the Board of Engineers for Rivers and Harbors created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on Charleston Harbor, South Carolina, submitted in House Document Numbered 249, Sixty-ninth Congress, first session, and previous reports, with a view to determining whether it is advisable to modify the existing project in any way at this time.

2. Charleston Harbor includes the lower portions of the estuaries of the Cooper and Ashley Rivers which unite at Charleston and discharge into the Atlantic Ocean about midway of the coast of South Carolina, 75 miles northeast of the mouth of the Savannah River. The mean tidal range is 5.2 feet. Improvement authorized by Congress provides for commercial purposes a channel 30 feet deep, 1,000 feet wide between entrance jetties and of various widths in Town Creek, an alternate channel in the lower river, and in Cooper River to Goose Creek, about 14 miles above the head of the entrance channel; a channel in Shipyard River, a tidal tributary of Cooper River just below the

navy yard, 30 feet deep to and including a turning basin about 2,500 feet above the mouth and 20 feet deep for an additional distance of 2,500 feet upstream; and a channel 30 feet deep and 300 feet wide in the Ashley River to the Standard wharf, a distance of 7.25 miles. The costs of this improvement and maintenance to June 30, 1940, have been approximately $8,069,000. In addition, the Navy has dredged in the river below the navy yard at a cost of $175,000 and at the time of construction of the Army supply base (now the port terminals) over 2,000,000 cubic yards of material were removed to obtain a channel 30 feet deep in front of the docks. The approved estimate for annual cost of maintenance is $95,000. The authorized project for Charleston Harbor provides that as found necessary in the interest of national defense a depth of 40 feet may be secured; 1,000 feet wide through the entrance, 600 feet wide to the south pier at the navy yard, and 1,000 feet wide thence to the Commandant's wharf. The additional cost for the enlargement is estimated at $3,603,000 for new work and $250,000 annually for maintenance. The National Defense River and Harbor Act approved October 17, 1940, authorized modification of the existing commercial project for Charleston Harbor, S. C., to provide a depth of 35 feet from the 35-foot contour in the Atlantic Ocean through the Town Creek Channel to the upper end of the turning basin at the port terminals on Cooper River, all at the widths authorized by the existing project; and for a channel in Shem Creek 10 feet deep and 110 feet wide from a flared entrance from Hog Island Channel to and including a turning basin 130 feet wide and 400 feet long with the upper end 250 feet upstream of the Mount Pleasant public wharf; at an estimated first cost of $465,000, with annual maintenance of $85,000, including that now required.

3. Charleston is the largest city and principal seaport of South Carolina. It has a population of 71,000 and its 160 manufacturing plants turn out pulpboard, fertilizer, petroleum products, creosoted timber, jute bagging, asbestos, and a variety of other products estimated as worth $50,000,000 annually. Main-line railroads and improved highways serve the area. The Intracoastal Waterway traverses the harbor. In its location between the Cooper and Ashley Rivers the city has a long water frontage that has been extensively developed for commercial use. Shem Creek serves the suburban town of Mount Pleasant which is connected with Charleston by a ferry operating from a dock in the creek. Annual commerce in Charleston Harbor has averaged 2,000,000 tons over the past 20 years; approximately 85 percent of it carried in seagoing vessels. The 1939 commerce of 2,375,580 tons was carried in 15,100 round trips of vessels of drafts under 18 feet and 600 trips of drafts from 18 to 33 feet.

4. Representatives of the city of Charleston request the improvement of a large area lying between the Folly Island Channel and the South Channel, southeast of Castle Pinckney and west of Fort Moultrie, to provide a commodious anchorage for the many naval vessels that they believe should be based at Charleston.

5. The district engineer has prepared estimates of cost for dredging various anchorages, including that preferred by the city authorities. He finds, however, that existing anchorage grounds in Charleston Harbor are adequate for existing naval and commercial navigation and he recommends that no additional anchorage area be provided at this time. The division engineer concurs.

6. At a public hearing before the Board, representatives of the city of Charleston presented a brief and made oral representation of the advantages of Charleston Harbor as a base for naval operations. They urged the necessity for providing for the accommodation of a large number of naval vessels.

7. A representative of the Navy Department submitted a formal statement, as follows:

The Navy Department has studied the revised project to dredge the modified area "B" in Charleston Harbor, to provide anchorage for 20 cruisers or 50 destroyers. From a consideration of the Navy's present and prospective plans, it does not appear that this proposed dredging project is of immediate necessity, and the Navy Department does not feel justified in supporting the project for immediate accomplishment. There are other river and harbor projects which the Navy considers are more urgently needed for national defense, as far as naval purposes are concerned, and for which available funds could be more advantageously expended. However, the Navy Department does have an interest in the eventual accomplishment of this project, and is prepared to support it as a national defense project with low priority.

VIEWS AND RECOMMENDATIONS OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

8. In view of the time that normally must elapse between recommendation of a project and its authorization and subsequent accomplishment the Board now recommends modification of the existing national-defense project for Charleston Harbor, S. C., to provide an anchorage area 30 feet deep in the water area between Castle Pinckney and Fort Moultrie, substantially in accordance with the plan of the district engineer for area B–1, at an estimated first cost of $1,820,000, with $12,500 annually for maintenance, in addition to the amounts now authorized.

For the Board:

Thomas M. Robins,
Brigadier General, Corps of Engineers,
Senior Member.

REEXAMINATION OF CHARLESTON HARBOR, S. C.

SYLLABUS

The district engineer finds that further improvement of Charleston Harbor to provide additional naval anchorage would be justified only as a measure of national defense to meet possible increased naval needs. The Navy Department states that they do not desire additional anchorage in Charleston Harbor and he, therefore, recommends that none be provided at this time.

War Department,
United States Engineer Office,
Charleston, S. C., August 15, 1940.

Subject: Review of previous reports on Charleston Harbor, S. C.
To: The Division Engineer, South Atlantic Division, Richmond, Va.

1. *Authority.*—This report is submitted in compliance with the following resolution adopted by the Committee on Rivers and Harbors, House of Representatives, United States, on February 16, 1940:

Resolved by the Committee on Rivers and Harbors of the House of Representatives, United States, That the Board of Engineers for Rivers and Harbors, created under section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on Charleston Harbor, South Carolina, submitted in House Document numbered 249, Sixty-ninth Congress, first session, and previous reports with a view to determining whether it is advisable to modify the existing project in any way at this time.

2. House Document No. 249, Sixty-ninth Congress, first session, forms the basis of the existing project for Charleston Harbor, S. C., as described in paragraphs 21 to 23, inclusive, herein. It contains reports on preliminary examination and survey submitted in compliance with an item in the River and Harbor Act of August 8, 1917, authorizing a preliminary examination and survey of Charleston Harbor and Cooper River, S. C., from the entrance to Sanders Creek, now Yellow House Creek, including Town Creek channel, and an item in the River and Harbor Act of March 3, 1925, authorizing a preliminary examination and survey of Charleston Harbor, S. C.

3. *Description.*—Charleston Harbor, approximately midway of the coast of South Carolina, is 140 miles southwest of the entrance to Cape Fear River, N. C., 50 miles southwest of Winyah Bay, S. C., and 75 miles northeast of the entrance to Savannah River, Ga. It lies in the tidal estuary of the lower 12 miles of Cooper River and the 4 miles of open bay extending thence from the confluence of Ashley and Cooper Rivers to the Atlantic Ocean.

4. The entrance to the harbor is protected by granite jetties 2,900 feet apart which spring from Sullivans Island and Morris Island, north and south, respectively, of the entrance. The width in the open bay portion from the ocean to the confluence of Ashley and Cooper Rivers at the south end of the city of Charleston is approximately 2 miles; above this latter point the harbor proper follows Cooper River, gradually narrowing from 1 mile to one-half mile. Town Creek is a side channel of Cooper River 2 miles long passing around the west side of Drum Island. Both ends open into Cooper River.

5. The entrance channel to Charleston Harbor is maintained to project dimensions of 30 feet depth for a width of 1,000 feet beyond and between the jetties. The inner harbor is maintained to project dimensions of 30 feet depth for a width of 600 feet, widened to 800 feet at bends, to the navy yard via Cooper River, and thence 400 feet wide, widened to 600 feet at bends, to the ordnance depot wharf one-fourth mile below the head of the project at Goose Creek. In the upper one-fourth mile of the project a depth of 30 feet obtains for a width of 100 feet. In Town Creek project depth of 30 feet for a width of 500 feet is maintained. For a distance of approximately 5 miles, from a point in South Channel north of Fort Sumter to the lower end of Town Creek, the controlling depth is 35 feet for a width of 350 feet, while the general depth ranges upward to 45 feet for a width of as much as 1,200 feet.

6. Cooper River extends 19 miles above the mouth of Goose Creek, the upper limit of Charleston Harbor, with depths ranging from 11 to 30 feet to the junction of the East Branch and West Branch of Cooper River. These headwater streams have their sources about 20 miles further northwesterly. Depths in the branches range from 3 to 12 feet. Cooper River, above Goose Creek, and its branches have not been improved. After completion of the Santee-Cooper hydroelectric project now under construction a large portion of the flow in Santee

River will be diverted from the reservoir to be provided on that stream through a diversion canal, the Pinopolis Reservoir, and a tail canal into West Branch of Cooper River at a point 13 miles above its junction with East Branch. The terms of the Federal Power Commission license under which the project is being constructed require that the discharge that shall be allowed to pass down Santee River through the Santee Dam shall not be less than 500 second-feet. The Santee-Cooper project plans contemplate a minimum depth of 11 feet in the diversion and tail canals for navigation. The plans also contemplate enlargement of the channel in West Branch of Cooper River below the tail canal to a minimum depth of 11 feet at mean low water, thus affording a continuous channel of 11 feet controlling depth from Charleston to a point in Santee Reservoir near the head of Santee River.

7. Shipyard River, a tidal tributary entering Cooper River 5.3 miles above its mouth and just below the naval reservation, is maintained to project dimensions of 30 feet depth and 200 feet width in its lower three-fourths of a mile to the head of the Gulf Oil Corporation terminal with a turning basin opposite that point; and thence to project dimensions of 20 feet depth and 100 feet width for an additional three-quarter mile to a point 50 feet above the Tuxbury Lumber Co.'s wharf.

8. Ashley River is maintained to project dimensions of 30 feet depth and 300 feet width from the mouth to the old Standard Fertilizer Wharf, a distance of 7¼ miles with a turning basin opposite this wharf.

9. Shem Creek, a small tidal tributary approximately 2 miles long, enters Hog Island Channel in the lower harbor from the east at the town of Mount Pleasant, opposite the city of Charleston. The controlling depth in this creek is 8 feet at mean low water in the lower one-half mile. The controlling depth thence upstream for the next three-fourths of a mile is approximately 3 feet at mean low water. Above that point the depth rapidly diminishes to less than 1 foot. A fixed highway bridge having a horizontal clearance of 33 feet and a vertical clearance of 19.2 feet at mean low water and owned by the State highway department, is located three-quarters of a mile above the mouth.

10. The Intracoastal Waterway traverses Charleston Harbor. In the section extending northward to Winyah Bay work is in progress and expected to be completed during October 1940 to enlarge the channel to 12 feet depth for a width of 90 feet. In the section extending southward to Beaufort work is in progress and expected to be completed during September 1940 to enlarge the channel to 12-foot depth for a width of 90 feet.

11. The established anchorage grounds in Charleston Harbor approved by the Secretary of War on August 8, 1921, include all the navigable portions of the harbor except authorized channels and certain cable crossings. Vessels carrying explosives in bulk may anchor only in a reach on the west side of Wando River between a point opposite the south end of Daniel Island and a point 1 mile to the north thereof. The Quarantine Anchorage is on the south side of the harbor abreast of the Quarantine Station.

12. Immediately inside the harbor entrance adjacent to the southerly end of Sullivans Island there is an area known locally as Rebellion

Roads where deep-draft vessels occasionally anchor. Natural depths range up to 72 feet, gradually decreasing in a connecting swash channel known as Folly Island Channel which joins Cooper River just south of Castle Pinckney on Shutes Folly Island. The controlling depth is 18 feet at a point opposite Castle Pinckney. This channel is generally used by craft plying between Charleston Harbor and Fort Moultrie and other points on or near the Intracoastal Waterway to the northward.

13. There are two naval mooring buoys about midway of this swash channel; four others on the east side of Cooper River just south of Castle Pinckney; and 8 others on the sides of Cooper River channel opposite the lower end of Drum Island. Areas remaining for commercial anchorage in deep water clear of the channel will accommodate only a limited number of vessels.

14. The mean tidal range is 5.1 feet, although this is increased to 7 or 8 feet under the influence of northeast winds of long duration, or storms.

15. The locality is shown on United States Coast and Geodetic Survey charts Nos. 470 and 491 and on the enclosed map.

16. *Tributary area.*—Charleston is the largest city and the principal seaport of South Carolina. Its population according to preliminary estimates of the 1940 census is 70,869. It has the natural advantages of being relatively close to the sea and of having large sheltered areas of deep water. On the east bank of Ashley River and the west bank of Cooper River are the port's water-front developments. Its waterborne commerce during the calendar year 1939 amounted to 2,375,582 tons. The principal commodities handled consisted of petroleum products, fertilizer material, coal, lumber, fresh fruits, scrap iron, and sugar.

17. There are 160 manufacturing plants in and adjacent to Charleston which have an annual production value estimated at $50,000,000. The most recent industrial expansion of the city consists of a large pine pulp mill situated on Cooper River in the upper portion of the harbor, with an estimated output of 200,000 tons of pulpboard annually. The principal manufactures of Charleston consist of pulpboard, fertilizer, petroleum products, creosoted-wood products, and asbestos products.

18. The port of Charleston is served by three railroads, the Atlantic Coast Line, the Seaboard Air Line, and the Southern, affording connections with all parts of the United States. Highways entering the city form a portion of the State and Nation-wide network of improved highways.

19. *Bridges.*—There is but one bridge crossing Charleston Harbor, the fixed-span highway toll bridge of the Cooper River Bridge Co. It is on Highways Nos. 17 and 701, the sea-level route, leading north from Charleston across Cooper River and Town Creek Channels and Drum Island lying between. The vertical clearances of the navigation spans are 135 feet at mean high water and 140 feet at mean low water for a horizontal distance of 600 feet at Town Creek Channel and 1,000 feet at Cooper River Channel. The central 300 feet of the Cooper River span has a vertical clearance of 150 feet at mean high water and 155 feet at mean low water.

20. *Prior reports.*—In addition to the report under review, the following reports have been submitted:

Document	Nature of report	Recommendation, character of work, and estimate
H. Doc. No. 83 (55th Cong., 3d sess.).	Favorable	Recommended dredging to secure a channel 26 feet deep at low water and 600 feet wide, by constructing a large seagoing suction dredge and operating it in connection with the dredge then owned by the work. The estimated cost, including the building of the dredge, was $285,000.
H. Doc. No. 499 (58th Cong., 2d sess.).	do	Recommended dredging to secure an entrance channel 28 feet deep, 500 feet wide between the jetties and 1,000 feet wide seaward thereof. Estimated cost, $371,616 for new work and $40,000 annually for maintenance.
H. Doc. No. 947 (61st Cong., 2d sess.).	do	Recommended that, considering the needs of the Navy Department, a channel be obtained in Cooper River by dredging 30 feet deep at all stages of tide and 600 feet wide in straight reaches, increasing to 1,000 feet at bends, up to the naval station; estimated cost, $175,000.
H. Doc. No. 288 (62d Cong., 2d sess.).	do	Recommended dredging to secure a depth of 30 feet provided local authorities show that they would provide adequate terminal facilities. Estimated cost (in addition to funds on hand), $140,000 for new work and $40,000 annually for maintenance.
River and Harbor Committee Doc. No. 19 (63d Cong., 2d sess.).	do	Recommended a channel to the naval reservation 26 feet deep and 300 feet wide. Estimated cost, $14,000.
H. Doc. No. 480 (68th Cong., 2d sess.).	do	Recommended modification of the existing project to provide for dredging to a depth of 30 feet an irregular area in Cooper River where a shoal had formed about 2 sunken wrecks, at an estimated cost of $25,000.
H. Doc. No. 259 (76th Cong., 1st sess.).	do	Recommended modification of the existing project to deepen the existing channel via Town Creek to 35 feet from the sea to the Port Terminals, and to provide a channel in Shem Creek 10 feet deep and 110 feet wide at a total cost of $465,000.

21. *Existing project.*—This provides for commercial purposes a channel 30 feet deep 1,000 feet wide from the sea to the inner ends of the jetties, thence 600 feet wide to the navy yard and thence 400 feet wide to Goose Creek, with a turning basin 700 feet wide at the port terminals, together with a channel 30 feet deep at mean low water and 500 feet wide through Town Creek, at a total estimated cost of $314,000 for new work and $95,000 annually for maintenance.

22. The project also provides, as a national defense rather than a commercial measure, to be prosecuted only as found necessary in the interest of national defense, a 40-foot channel 1,000 feet wide from the sea to the inner end of the jetties, these jetties to be of stone on log-mattress foundation, the north jetty having a length of 15,443 feet and the south jetty of 19,104 feet; thence 600 feet wide to the south pier at the navy yard and thence 1,000 feet wide to the commandant's wharf, at an estimated first cost of $3,603,000 and $250,000 annually for maintenance, both figures being additional to the estimates for the commercial project. These estimates were made in 1925 and are exclusive of expenditures on previous projects. The existing project was adopted by the River and Harbor Act of January 21, 1927, the report under review forming the basis for its adoption.

23. The existing commercial project has been completed except for a small amount of work necessary to secure project dimensions in a short reach at the head of the project. The costs to June 30, 1940, exclusive of amounts expended on previous projects and including $600 of contributed funds, were $1,080,175.60, of which $362,260.69 was for new work and $717.914.91 was for maintenance.

24. Recommendation has been made, as set forth in House Document No. 259, Seventy-sixth Congress, first session, that the commer-

cial project be modified to provide a depth of 35 feet from the 35-foot contour in the ocean through the Town Creek channel to the upper end of the turning basin at the port terminals on Cooper River, at the widths authorized by the existing project; and for a channel in Shem Creek 10 feet deep and 110 feet wide from a flared entrance at Hog Island channel to a point 250 feet upstream from the Mount Pleasant public wharf, widened to 130 feet through the upper 400 feet; at an estimated cost of $465,000, with annual maintenance of $85,000 including that now required, subject to the provision that local interests furnish suitable spoil disposal areas as and when required for the initial work and subsequent maintenance.

25. *Previous projects.*—Previous projects and the river and harbor acts authorizing them are as follows:

The acts of June 18, 1878, and August 11, 1886, provided for construction of the jetties and dredging the entrance channel to a low-water depth of 21 feet.

The act of March 3, 1899, provided for deepening the entrance to 26 feet at mean low water 600 feet wide.

The act of June 25, 1910, provided for dredging to a depth of 28 feet at mean low water, 500 feet wide between the jetties and 1,000 feet wide seaward of them.

The act of August 8, 1917, provided for increasing the depth over the bar to 30 feet at mean low water.

The act of July 18, 1918, provided for a channel 40 feet deep at mean low water and 1,000 feet wide from the sea to the navy yard to be undertaken when the proposed new drydock at the navy yard, carrying a depth of 40 feet of water over the blocks, has been authorized. Under this project dredging was done in 1918 and 1919 on the channel between and beyond the jetties, securing a depth of 32 feet for a width of 300 feet, and in 1920 and 1921, in a 7,288-foot reach next below the navy yard to a depth of 40 feet for widths of 600 to 670 feet.

26. The total costs and expenditures under all previous projects amount to $6,988,444.61, of which $6,586,455.11 was for new work and $401,989.50 was for maintenance. Of the expenditures for new work $1,032,254.09 was applied to work on the 40-foot project.

27. In addition to the above, the Naval Appropriation Act of August 29, 1916, appropriated $175,000 for dredging to a depth of 30 feet in Cooper River below the navy yard. The work was completed in 1919. Other dredging in Cooper River from the navy yard to the Army supply base was done in 1918–19 by the constructing quartermaster in connection with building the supply base. Over 2,000,000 cubic yards of material were removed in securing a channel 30 feet deep, 400 feet wide in the straight reaches, increased to 500 feet at bends and 800 to 1,000 feet in front of the port terminals.

28. *Local cooperation.*—The River and Harbor Act of August 8, 1917, authorizing the 30-foot depth imposed the condition "that local interests furnish evidence satisfactory to the Secretary of War that they will provide terminal facilities commensurate with the needs of the port." This condition was met as approved by the Secretary of War on November 8, 1917. The requirement in the act of January 21, 1927, that local interests furnish without cost to the United States suitable dumping grounds for the disposal of dredged material has also been met.

29. *Other improvements*—During 1925 the Gulf Oil Corporation established a terminal on Shipyard River three-fourths of a mile above the mouth and dredged a channel 28 feet deep and 120 feet wide from deep water in Cooper River to the head of the terminal. The company subsequently deepened and maintained the channel to 30 feet depth until it was included in the authorized project for Shipyard River during 1935.

30. *Terminal and transfer facilities.*—There are 32 commercial piers, wharves, and docks on Cooper River and Town Creek, with a combined berthing space of 22,599 feet and with depth of water alongside up to 36 feet. There are transit sheds at 15 of the commercial piers with an aggregate area of 902,692 square feet used for the receipt, shipment and short-time storage of various commodities, and 8 adjacent warehouses with an aggregate of 2,157,160 square feet of floor space.

31. There are five Government-owned wharves on Cooper River. These are the ordnance depot wharf near the head of the improved channel, three wharves at the navy yard, and the Engineer and Quartermaster wharves at the customhouse.

32. The Port Utilities Commission of the city of Charleston owns Union pier with 1,318 feet of berthing space and two transit sheds with a total area of 78,300 square feet on Cooper River next upstream from the customhouse; and the Columbus Street terminal on Town Creek, with 1,420 feet of berthing space and 75,200 square feet of warehouse storage.

33. The facilities at the port terminals with 2,333 feet of berthing space, situated 2½ miles above the navy yard on Cooper River, were originally constructed for Army purposes and subsequently leased to the Port Utilities Commission for commercial use. Following acceptance of title by the city of Charleston during 1936, the terminal property was leased for a long term of years to the West Virginia Pulp & Paper Co. This company has constructed a large pine pulp and paper mill adjoining the terminal.

34. Other wharves include those of Read Phosphate Co., the Texas, Sinclair, and Standard Oil Cos.; the Southern, Atlantic Coast Line, and Seaboard Air Line Railway Cos.; the Oakdene, City, and the Concentration cotton compress companies; the Clyde-Mallory Steamship Co., the Johnson Coal Co., the Consumers Coal Co., and the Charleston Shipbuilding & Dry Dock Co.

35. On the lower three-quarters mile of Shipyard River where the project depth is 30 feet, there are located the wharves of the Etiwan Fertilizer Co., and the Gulf Oil Corporation. These have berthing space of 425 and 1,000 feet, respectively, with a depth alongside of from 28 to 30 feet. On the next three-quarters mile, where the project depth is 20 feet, there is located the plant of the North State Lumber Co., having a timber wharf with 200 feet of berthing space. The old wharf of the Tuxbury Lumber Co. is situated at the head of the adopted project. This company went out of business during 1939.

36. On the Charleston westerly water front on Ashley River there are located wharves of the United States Lighthouse Bureau, the Century Wood Preserving Co., the Planters Phosphate Co., the American Agricultural Chemical Co., and the Virginia-Carolina Chemical Co. Also on this shore is the partially completed city-owned seaplane base for trans-Atlantic air service, shoreward of which is the municipal yacht basin reached through a branch channel 1,000 feet long.

37. All of the above-described commercial wharves have rail connections with the trunk-line railroads entering the city and are in proximity to improved highways connecting with the State and Nation-wide systems. They are equipped with mechanical unloading devices, such as conveyors, hoists, and cranes, depending on the class of commodity handled, are adequate for present needs and in general are capable of expansion. Adequate coal and fuel-oil bunkering facilities are available on the Cooper River water front.

38. Exclusive of the naval reservation there are approximately 3 miles of water front on the western shore of Cooper River now unoccupied. The eastern shore of Cooper River opposite the city of Charleston is entirely unoccupied, as is the western shore of Ashley River.

39. *Improvement desired.*—In order to learn what modification of the existing project is desired by local interests a public hearing was held at Charleston on April 2, 1940. The hearing was attended by the mayor of Charleston; by representatives of the Chamber of Commerce, and other civic organizations including the Industrial Bureau, the Office of Port Development and the Maritime Association; by the Harbor Master and members of the Charleston Pilots' Association; by naval officers representing the Commandant of the Charleston Navy Yard; and by others representing business and shipping interests. A stenographic report[1] of the hearing and copies of letters[1] and papers[1] presented are attached hereto.

40. Local interests desire that the existing project for Charleston Harbor be modified so as to provide an anchorage for naval vessels as an operating base for cruisers, destroyers, and submarines. It was stated that the anchorage areas now available are inadequate to allow for an increase in commercial shipping or for greater numbers of naval vessels. A brief was presented at the hearing setting forth claims as to the advantages of the port of Charleston as an operating base for cruisers, destroyers, and submarines, and designating certain areas in the harbor to be dredged to a net depth of 20 feet to accommodate destroyers and submarines and one area to be dredged to a net depth of 30 feet to accommodate cruisers. The consensus of opinion of those present was that the most important of the several possible anchorage grounds to be secured was that designated in the brief as area B, situated on the northerly side of the lower harbor, adequate for 40 cruiser moorings if dredged to 30 feet depth. Until such time as anchorage should be needed for 40 cruisers it could be used also for destroyers and submarines. Advantages cited for this area are its convenient location with respect to the harbor entrance and the city; its use by naval craft without interference to commercial shipping in the harbor; and the release to commercial shipping of present anchorage space now occupied by navy moorings.

41. Shipping interests stated their belief that the existing anchorage grounds would be adequate for commercial shipping if utilized for that purpose only.

42. A naval officer present at the hearing stated that while he could not express any opinion for the Navy Department, it was his personal opinion that the "B" area is the best of the several areas laid out. He stated that some 12 or 13 years ago he served as navigator on the U. S. cruiser *Concord* when it was stationed at Charleston,

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[1] Not printed.

and that a great deal of trouble was encountered in turning the vessel at ebb tide. At that time it was customary to anchor the *Concord* in Cooper River opposite Charlotte Street and the lower end of Town Creek. To leave the harbor during ebb tide the ship would in turning pass down along the water front to near the lower end of the city before heading fair. He stated that if there had been any commercial navigation or other boats using the channel it would have been practically impossible to get out during ebb tide.

43. Subsequent to the public hearing information was received from the Navy Department that present plans do not contemplate the use of Charleston Harbor by a greater number of naval craft than can be accommodated at present, and that the Navy Department is therefore unable to lend support to the project on the basis of its immediate requirements. It was stated that should decommissioned destroyers be berthed at Charleston none of the proposed new anchorage areas would be used as the destroyers would probably be berthed in Cooper River close to navy yard repair and upkeep facilities. It was stated that any anchorage designed to accommodate destroyers should have a depth of at least 24 feet.

44. *Commerce.*—Approximately 88 percent of the commerce in Charleston Harbor during the calendar year 1939 was carried in seagoing vessels in foreign and coastwise trade, the remainder of the commerce comprising local and internal traffic. The principal commodities handled were imports of crude oil, nitrate of soda, and fresh fruit; exports of coal, wood products, and scrap steel; coastwise receipts of gasoline and other petroleum products, fertilizer materials, and vegetable food products; coastwise shipments of petroleum products, wood and paper products, and textiles; internal receipts and shipments of poles and piling, vegetable food products, and pulpwood; and a local movement of petroleum products and food products.

45. Tables 1 to 4, inclusive, show the annual commerce on Charleston Harbor for the 20-year period from 1920 to 1939, inclusive, and details of the 1939 commerce.

TABLE 1.—*Annual commerce on Charleston Harbor*

Year	Vessel traffic		Rafted		Total	
	Tons	Value	Tons	Value	Tons	Value
1920	2, 231, 606	$110, 574, 118	0	0	2, 231, 606	$110, 574, 118
1921	1, 509, 261	154, 454, 542	0	0	1, 509, 261	154, 454, 542
1922	1, 500, 385	109, 129, 689	132, 871	$2, 657, 420	1, 633, 256	111, 787, 109
1923	1, 944, 383	224, 035, 937	169, 674	684, 946	2, 114, 057	224, 720, 883
1924	1, 882, 406	185, 467, 152	199, 816	699, 356	2, 082, 222	186, 166, 508
1925	2, 831, 843	202, 695, 179	331, 890	1, 161, 515	3, 163, 733	203, 856, 694
1926	3, 032, 116	209, 139, 611	214, 058	767, 837	3, 246, 174	209, 907, 448
1927	2, 561, 431	198, 475, 042	218, 814	1, 531, 698	2, 780, 245	200, 006, 740
1928	2, 782, 596	186, 624, 052	204, 001	1, 689, 907	2, 986, 597	188, 313, 959
1929	2, 436, 608	177, 506, 661	244, 326	3, 038, 506	2, 680, 934	180, 545, 167
1930	2, 377, 908	123, 434, 744	141, 664	225, 972	2, 519, 572	123, 660, 716
1931	1, 784, 457	106, 680, 399	156, 739	397, 549	1, 941, 195	107, 077, 948
1932	1, 578, 910	97, 030, 322	68, 014	151, 576	1, 646, 924	97, 181, 898
1933	1, 640, 969	111, 680, 118	83, 417	144, 061	1, 724, 386	111, 824, 179
1934	1, 892, 141	70, 028, 957	63, 563	110, 102	1, 955, 704	70, 139, 059
1935	1, 942, 319	84, 238, 458	67, 630	198, 143	2, 009, 949	84, 436, 601
1936	1, 933, 823	101, 911, 936	72, 000	221, 000	2, 005, 823	102, 132, 936
1937	2, 785, 916	129, 819, 937	116, 870	448, 582	2, 902, 786	130, 268, 519
1938	2, 313, 151	88, 309, 805	74, 669	213, 356	2, 387, 820	88, 523, 161
1939	2, 375, 582	(1)	0	0	2, 375, 582	(1)
20-year average	2, 166, 890		128, 001		2, 294, 891	

[1] Values not compiled subsequent to 1938.

TABLE 2.—*Commerce on Charleston Harbor during calendar year 1939*

FOREIGN COMMERCE

Commodities	Imports	Exports
Animals and animal products:	*Tons*	*Tons*
Beef, canned	990	--------
Other animal products	82	10
Vegetable food products:		
Bananas	69, 098	--------
Coffee	2, 582	--------
Sugar	25, 423	--------
Other vegetable food products	2, 462	--------
Vegetable products, inedible:		
Starch, soluble	800	--------
Tobacco	----------	2, 211
Other inedible vegetable products	216	372
Textiles:		
Cotton	----------	8, 727
Cotton sweepings	----------	9, 472
Cotton waste	----------	1, 362
Rayon:		
Fiber	797	--------
Waste	255	--------
Other textiles	552	89
Wood and paper:		
Cross ties, creosoted	----------	20, 387
Lumber:		
Ash	----------	3, 715
Creosoted	----------	8, 123
Oak	----------	6, 171
Pine	----------	11, 302
Piles, creosoted	----------	1, 224
Pulpboard	----------	1, 898
Paper, newsprint	5, 569	--------
Other wood and paper products	209	2, 194
Nonmetallic minerals:		
Cement	2, 057	--------
Coal:		
Bituminous	----------	82, 368
Bunker	----------	46, 573
Nonmetallic minerals—Contd.	*Tons*	*Tons*
Fuel oil, bunker	----------	8, 660
Oil:		
Creosote	5, 186	--------
Crude	185, 072	--------
Other nometallic minerals	198	1, 578
Ores, metals, and manufactures of:		
Iron pyrites	4, 922	--------
Scrap iron and steel	----------	26, 565
Wire and wire goods	2, 711	--------
Other ores and metals	627	297
Machinery and vehicles:		
Agricultural implements	5	--------
Machinery	----------	182
Chemicals:		
Calnitro	5, 362	--------
Castor meal	4, 122	--------
Fertilizer	1, 399	--------
Fish meal	5, 539	--------
Guano	1, 262	--------
Leather meal	3, 204	--------
Manure salts	3, 182	--------
Muriate of potash	4, 729	--------
Nitrate of potash	6, 585	--------
Nitrate of soda	76, 056	--------
Salt cake	13, 781	--------
Sulphate of ammonia	4, 387	--------
Sulphate of potash	5, 527	--------
Other chemicals	460	454
Unclassified: General merchandise	155	9
Total	445, 563	243, 943

COASTWISE COMMERCE

Commodities	Receipts	Shipments
Animal, and animal products:	*Tons*	*Tons*
Fish, shrimp, and oysters, canned	6, 518	150
Other animal products	929	639
Vegetable food products:		
Beans, dried	2, 853	--------
Beverages	4, 370	--------
Coffee	1, 010	--------
Cottonseed meal	----------	2, 000
Flour and meal	7, 499	--------
Fruits, dried	2, 105	--------
Potatoes, seed	8, 849	--------
Rice	7, 944	--------
Sugar	1, 019	--------
Vegetables, canned	6, 142	--------
Other vegetable food products	4, 667	3, 916
Vegetable products, inedible:		
Castor meal	561	--------
Cigars	----------	1, 623
Naval stores	----------	616
Tobacco	914	--------
Other vegetable products	1, 334	325
Textiles:		
Bagging	2, 335	4, 955
Cotton	2, 032	480
Cotton goods	----------	29, 420
Tire cord and fabric	----------	1, 308
Other textiles	2, 523	1, 065
Wood and paper:		
Cross arms and ties	56	2, 487
Creosoted	----------	2, 827
Wood and paper—Continued.	*Tons*	*Tons*
Lumber	6, 171	5, 097
Creosoted	----------	4, 898
Manufactures of wood and paper	1, 766	6, 674
Paper, newsprint	3, 512	--------
Piling, creosoted	----------	3, 522
Pulpboard	----------	12, 001
Other wood and paper	4, 212	2, 767
Nonmetallic minerals:		
Asbestos	557	667
Asphalt	573	148
Bottles, empty	----------	3, 294
Clay	----------	4, 937
Gasoline	582, 707	1, 058
Grease	2, 197	--------
Kerosene	100, 128	144
Naphtha	10, 417	4, 824
Oil:		
Creosote	17, 944	--------
Bunker	----------	54, 277
Fuel	140, 183	--------
Furnace	5, 580	--------
Gas	13, 416	41, 054
Lubricating	24, 944	76
Tar, coal	7, 472	--------
Other nonmetallic minerals	5, 341	1, 079
Ores, metals and manufactures of:		
Cable and wire	1, 574	68
Drums, empty	----------	1, 089

TABLE 2.—*Commerce on Charleston Harbor during calendar year 1939*—Continued

COASTWISE COMMERCE—Continued

Commodities	Receipts	Shipments	Commodities	Receipts	Shipments
Ores, metals and manufactures of—Continued.			Chemicals—Continued.	*Tons*	*Tons*
	Tons	*Tons*	Potash	15,002	--------
Manufacturers of iron and steel	10,304	1,271	Soda	1,974	--------
Other ores and metals	242	31	Sulfur	30,233	--------
Machinery and vehicles:			Tankage	8,182	--------
Automobiles	684	447	Other chemicals	2.907	2,443
Machinery	369	174	Unclassified: General merchandise	33,919	5,667
Chemicals:			Total	1,205,214	209,518
Nitrates	59,428	--------			
Phosphate rock	49,616	--------			

INTERNAL AND LOCAL COMMERCE

Commodities	Internal commerce		Local commerce
	Receipts	Shipments	
Animal and animal products:	*Tons*	*Tons*	*Tons*
Oystershell, crushed	5,830	--------	--------
Other animal products	--------	123	295
Vegetable food products:			
Cabbage	1,683	--------	962
Potatoes	14,652	--------	2,017
Sugar	2,123	--------	--------
Tomatoes	12,012	--------	726
Vegetables, fresh	1,027	--------	--------
Other vegetable food products	383	486	80
Vegetable products, inedible:			
Tobacco stems	315	--------	--------
Other vegetable products, inedible	--------	796	173
Textiles:			
Bags, burlap	--------	154	--------
Cotton	--------	--------	299
Cotton sweepings	--------	--------	2,150
Other textiles	37	150	36
Wood and paper:			
Cross ties	8,200	--------	--------
Lumber	6,153	3,794	1,275
Creosoted	--------	3,081	1,423
Poles and piles	52,100	463	--------
Creosoted	--------	652	2,572
Pulpwood	20,029	--------	--------
Other wood and paper	110	431	1,306
Nonmetallic minerals:			
Coal	2,654	2,441	--------
Gasoline	--------	--------	933
Oil:			
Fuel	--------	79,604	7,020
Lubricating	1,057	46	149
Gravel	1,850	1,120	--------
Other nonmetallic minerals	201	1,004	1,161
Ores, metals, and manufactures of:			
Steel, structural	248	135	--------
Other ores, metals, and manufactures of	170	340	5,020
Machinery and vehicles: Machinery	--------	27	9
Chemicals:			
Fertilizer	315	3,960	450
Fertilizer materials	4,479	4,393	--------
Other chemicals	179	63	--------
Unclassified: General merchandise	3,546	520	152
Total	139,353	103,783	28,208

Grand total, foreign, coastwise, internal, and local, 2,375,582 tons.

Cargoes in transit for 1939 amounted to 1,122,843 tons, and general ferry traffic amounted to 7,532 tons.

TABLE 3.—*Vessel traffic on Charleston Harbor during the calendar year 1939*

Draft	Steamers	Motor vessels	Sailing	Barges	Ferry	Total
IN-BOUND						
28 to 30 feet	25	2				27
26 to 28 feet	102	12				114
24 to 26 feet	68	4				72
22 to 24 feet	48	6				54
20 to 22 feet	117	5				122
18 to 20 feet	212	6				218
Under 18 feet	1, 362	9, 973	115	917	2, 750	15, 117
Total	1, 934	10, 008	115	917	2, 750	15, 724
OUT-BOUND						
28 to 30 feet	13	1				14
26 to 28 feet	28	2				30
24 to 26 feet	34	3				37
22 to 24 feet	61					61
20 to 22 feet	103	9				112
18 to 20 feet	268	12				280
Under 18 feet	1, 421	9, 889	106	942	2, 750	15, 108
Total	1, 928	9, 916	106	942	2, 750	15, 642

TABLE 4.—*Summary of Charleston Harbor commerce for 1939*

Kind	Tons
Foreign:	
Imports	445, 563
Exports	243, 943
Coastwise:	
Receipts	1, 205, 214
Shipments	209, 518
Internal:	
Receipts	139, 353
Shipments	103, 783
Local	28, 208
Total	2, 375, 582
Cargoes in transit	1, 122, 843
General ferry traffic	7, 532
Passengers	244, 645

46. *Prospective commerce.*—Available statistics of the commerce on Charleston Harbor during the first 6 months of the calendar year 1940 indicate that there will be an appreciable decrease for the year in foreign commerce as compared with 1939, due to disturbed world conditions. Indications are that domestic commerce for the year will show a decided gain over 1939, offsetting in part the loss of foreign trade. With a return to normal conditions it is likely that the tonnage of foreign commerce will be restored to its former level.

47. The recent completion of work to deepen the Ashley River channel from 20 to 30 feet is expected to result in large savings in transportation costs to manufacturing plants located on that stream and a consequent increase in business. The adoption and completion of the recommended project to deepen Charleston Harbor from 30 to 35 feet would permit economies through the use of deeper-draft tank and cargo vessels and should result in a further increase in the commerce of the port through the expansion of established firms and the attraction of new enterprises.

48. Officials of the South Carolina Public Service Authority are conducting surveys and studies to determine the most desirable type of industries to be encouraged to locate in the Charleston area to take advantage of the large power output of the Santee-Cooper hydroelectric project now under construction and scheduled for completion in 1941.

It is reasonable to expect that the combination of available sites on deep water and a nearby source of cheap power might attract such new plants as those for the manufacture of aluminum, cement, pulp, chemicals, or other products, any of which might materially increase the commerce of the harbor.

49. The proposed anchorage basins would be beneficial as regards the safety and convenience of established navigation, particularly should there develop increased activity of commercial or naval craft. However the improvement would not in itself increase the commerce of the port, and consequently no monetary value has been placed upon it.

50. *Survey.*—Soundings, located by transit from shore stations, were taken in the areas under consideration for improvement as possible anchorage grounds. Probings were taken to determine the character of materials to be encountered. The accompanying map has been prepared from information secured during this survey augmented by data secured during current investigations in connection with maintenance operations.

51. *Plan of improvement.*—Consideration has been given to a plan for securing anchorage areas by deepening shallow areas along the existing channels. Estimates have been prepared on the basis of providing a net depth of 24 feet in those areas intended for use by destroyers or submarines, and a net depth of 30 feet in the area intended for cruisers. All estimates include a provision for 1 foot of overdepth dredging. The swinging radius allowed for each destroyer or submarine mooring is 450 feet and that for cruiser moorings 750 feet.

52. Estimates are given below of the excavation that would be required to obtain a net depth of 24 feet in the several areas considered for destroyers or submarine bases:

TABLE 5.—*Estimated quantities of excavation for destroyer or submarine bases*

Area designation	Location	Excavation required	Number of moorings
		Cubic yards	
A	Upstream side in confluence of Cooper and Wando Rivers	10, 056, 000	28
A–A	Easterly portion of Area A	2, 623, 000	14
A–2	Two-mile reach of the easterly side of Wando River	11, 749, 000	28
A–2A	Channelward portion of Area A–2	5, 116, 000	14
B–1	Northerly side of lower harbor between Castle Pinckney and Fort Moultrie.	7, 742, 000	54
C	Southerly side of lower harbor between Fort Sumter and the Quarantine Station.	17, 951, 000	29
C–1	Southerly side of Ashley River near its mouth	16, 904, 000	29
C–1A	Channelward portion of Area C–1	5, 302, 000	14

53. The estimate for area A–2 given in table No. 5 includes 1,522,000 cubic yards of material in Wando River to provide an access channel 24 feet deep and 300 feet wide from deep water in Cooper River. An additional area located in Wando River was suggested by local interests for consideration as a destroyer base, designated as area A–1 in the brief presented at the public hearing. However this area has been found to be unsuitable due to its proximity to the established explosives anchorage and accordingly detailed estimates have not been prepared for its improvement.

54. Area B, the proposed cruiser base desired by local interests, comprises practically all of the water area between Castle Pinckney

and Fort Moultrie, a roughly rectangular area of about 3.5 square miles. It is estimated that 40,716,000 cubic yards of material would need to be excavated to provide a net depth of 30 feet over all of the area. A serious disadvantage of this plan is that the area is crossed by the Mount Pleasant range of the entrance channel, with the result that moored vessels would obscure or confuse the range lights. The plan would have the further disadvantage of interference with the channels leading to the Intracoastal Waterway and to Shem Creek.

55. Accordingly a plan has been considered for improving only a portion of area B to a net depth of 30 feet. This area, designated as area B–1, is the southerly portion of area B, or that portion south of an east and west line clearing the Castle Pinckney Wharf and west of the Mount Pleasant range. The area is sufficient for 20 cruisers. The removal of 15,100,000 cubic yards of material would be required. As previously shown in table No. 5, area B–1 would accommodate 54 destroyer moorings, requiring the removal of 7,742,000 cubic yards of material to obtain a net depth of 24 feet. No work would be necessary to provide an area for the 14 destroyer moorings now in the harbor, 8 in Cooper River and 6 in or near area B–1, inasmuch as a portion of the area B–1 already has natural depths in excess of 24 feet. Area B–2, a smaller portion of this area with room for 7 cruiser moorings would require the removal of 4,587,000 cubic yards of material to obtain a net depth of 30 feet.

56. *Estimated unit costs.*—The material that would be excavated in deepening any of the areas under consideration is such that it could be readily handled by either pipe line or hopper dredges. The material is principally mud and sand, mixed in some instances with shell and clay. The use of pipe-line dredges is indicated for areas A, A–2, C, and C–1 due to their proximity to marshland that could be used for the deposit of spoil. Under these conditions it is estimated that a unit price of 8 cents per cubic yard is a safe and conservative basis for determining probable costs. For the improvement of all or a part of area B involving unusually long pipe lines it is estimated that unit costs would be increased 50 percent over the other areas considered or to 12 cents a cubic yard. This is also the estimated unit cost for work in this area by hopper dredges.

57. The estimated first costs for providing a net depth of 24 feet in the several areas considered for destroyer or submarine bases and a net depth of 30 feet in areas considered for cruiser bases are given in the following tables:

TABLE 6.—*Estimated first costs for destroyer or submarine bases*

Area	Number of moorings	Cubic yards	First cost at unit cost of 8 cents per cubic yard	Unit cost per mooring
A	28	10, 056, 000	$804, 480	$28, 700
A–A	14	2, 623, 000	209, 840	15, 000
A–2	28	11, 749, 000	939, 920	33, 500
A–2A	14	5, 116, 000	409, 280	29, 200
B–1	54	7, 742, 000	[1] 929, 040	17, 200
C	29	17, 951, 000	1, 436, 080	49, 500
C–1	29	16, 904, 000	1, 352, 320	46, 600

[1] Unit cost of 12 cents per cubic yard used for this area.

TABLE 7.—*Estimated first costs for cruiser bases*

Area	Number of moorings	Cubic yards	First cost at unit cost of 12 cents per cubic yard	Unit cost per mooring
B	40	40,716,000	$4,885,920	$122,000
B-1	20	15,100,000	1,812,000	90,600
B-2	7	4,587,000	550,440	78,600

58. The absence of any large silt-bearing river emptying into Charleston Harbor creates very favorable maintenance conditions. Shoaling takes place at a relatively slow rate and is confined largely to dredged reaches connecting natural deep pools. It is believed however, that the rate of shoaling in the proposed anchorage basins would be at a somewhat greater rate than in the channels since the tidal currents would be checked in flowing through the basins with a tendency to drop material in suspension.

59. Maintenance estimates given herein allow for dredging all or part of each area every second year. Since the shoals would be shallow the criteria for estimated maintenance costs has been taken as the time that would be required for a dredge to work over the areas rather than the pumping capacity of the dredge. Estimates for all areas except B are based on the use of a 20-inch pipe-line dredge cutting an average width of 250 feet and advancing an average of 12,500 feet per month at a cost of $25,000 per month.

60. In Cooper River north of Drum Island, passing area A, maintenance dredging has been required on an average of every second year. The deposit is more pronounced along the north side of the channel adjacent to area A. It is expected that shoaling will continue at this locality following the deepening of area A, and that approximately one-half of the area will need maintenance dredging every second year at an annual cost of $40,500. Area A–2 is located along the concave side of a long bend in Wando River where ebb velocities would tend to prevent excessive shoaling. Annual maintenance here is estimated at $24,000, based on dredging one-fourth of the area each second year.

61. Area C would probably shoal at a greater rate than any of the other areas under consideration due to its position near the entrance channel and due to the fact that it is surrounded on three sides by shallow water. This area if deepened would become more or less of a catch basin that would trap sand and silt carried through the harbor entrance on flood tide and which now is in turn swept out during ebb tide. It is estimated that annual maintenance of area C would amount to $95,000, based on dredging the entire area every second year. Area C–1, situated along the southerly shore of Ashley River near its mouth, is more favorably located than area C with respect to maintenance, it being estimated that not more than one-fourth of the area would require biannual dredging, at an average annual cost of $27,000. The outer portions of areas A, A–2, and C–1, each with sufficient space for 14 destroyer moorings and designated as areas A–A, A–2A, and C–1A, could probably be maintianed to a depth of 24 feet at an

average annual cost of not exceeding $10,000 each since only a moderate amount of widening of existing channels would be required.

62. It is estimated that shoaling which would occur in the proposed cruiser anchorage, area B, deepened to 30 feet would require the use of a hopper dredge for 4 months every other year for its removal at an average yearly cost of $50,000. The southerly half of this area, designated as area B–1, contains an area of naturally deep water and could probably be maintained to a depth of either 24 or 30 feet for $12,500 annually, based on 1 month's hopper dredge work every 2 years. The maintenance of area B–2, a 1,500-foot strip following the best natural depths across B–1 would probably amount to one-half this amount, or $6,250 annually.

63. *Other Federal costs.*—Federal costs other than dredging would be involved through the necessity of relocating two Government-owned submarine telephone cables, one of which connects Fort Moultrie and Fort Sumter with Charleston and one of which connects the quarantine station with Charleston. Both cables cross area B and area C. It is believed that both cables could be raised and relaid in or near the prohibited anchorage areas along the existing channels in such manner as to clear the proposed anchorage grounds. The relocation of the quarantine cable would not involve any additional length, while the relocated cable to Fort Sumter and Fourt Moultrie would require 3,000 feet of new cable to clear area B and an additional 1,000 feet to clear area C. Estimated costs for cable changes are $13,000 for area B and $4,000 for area C.

64. *Federal investment and annual carrying charges.*—A construction period of 1 year or less is estimated for all of the proposed anchorage areas except area B which is estimated to require 2 years time for completion. There is given in tables 8 and 9 below the total Federal investment and total annual carrying charges for the several plans of improvement under consideration. The useful life of the proposed improvements is indefinite and therefore no allowance is made for amortization.

TABLE 8.—*Federal investment*

DESTROYER OR SUBMARINE BASES, 24-FOOT NET DEPTH

Proposed improvement	Estimated expenditure by the Engineer Department	Estimated expenditure by other Federal departments	Total Federal first costs	Interest during construction	Total Federal investment
Area A	$804, 480	$0	$804, 480	0	$804, 480
Area A–A	209, 840	0	209, 840	0	209, 840
Area A–2	939, 920	0	939, 920	0	939, 920
Area A–2A	409, 280	0	409, 280	0	409, 280
Area B–1	929, 000	13, 000	942, 000	0	942, 000
Area C	1, 436, 080	4, 000	1, 440, 080	0	1, 440, 080
Area C–1	1, 352, 320	0	1, 352, 320	0	1, 352, 320
Area C–1A	424, 160	0	424, 160	0	424, 160
CRUISER BASES, 30-FOOT NET DEPTH					
Area B	$4, 885, 920	$13, 000	$4, 898, 920	$146, 970	$5, 045, 890
Area B–1	1, 812, 000	13, 000	1, 825, 000	0	1, 825, 000
Area B–2	550, 440	13, 000	565, 440	0	565, 440

TABLE 9.—*Federal annual carrying charges*

DESTROYER OR SUBMARINE BASES, 24-FOOT NET DEPTH

Proposed improvement	Federal investment	Annual Federal carrying charge		Total annual Federal carrying charge
		Interest at 3½ percent	Increased annual maintenance	
Area A	$804, 480	$28, 160	$40, 500	$68, 660
Area A-A	209, 840	7, 340	10, 000	17, 340
Area A-2	939, 920	32, 900	24, 000	56, 900
Area A-2A	409, 280	14, 320	10, 000	24, 320
Area B-1	929, 000	32, 515	12, 500	45, 015
Area C	1, 440, 080	50, 400	95, 000	145, 400
Area C-1	1, 352, 320	47, 330	27, 000	74, 330
Area C-1A	424, 160	14, 840	10, 000	24, 840
CRUISER BASES, 30-FOOT NET DEPTH				
Area B	$5, 045, 890	$176, 610	$50, 000	$226, 610
Area B-1	1, 825, 000	63, 880	12, 500	76, 880
Area B-2	565, 440	19, 790	6, 250	26, 040

65. *Discussion.*—The 8 existing naval moorings in Cooper River just south of the highway bridge occupy space that would be desirable for anchoring deep-draft commercial ships due to their convenient location with respect to the principal terminals. In accordance with a request made during 1939 by the local harbor master 3 other moorings were removed from this vicinity by the Navy Department. This facilitated the movement of vessels and extended the anchorage grounds available to commercial ships. In the harbor master's letter of May 9, 1939, it is pointed out that 1 or 2 moorings on each side of the channel just south of the bridge would not be objectionable. Also that the moorings south of Castle Pinckney and in Ashley River do not interfere with the commercial anchorage. Local shipping interests agree that the area immediately south of Cooper River Bridge would provide adequate anchorage for all existing and prospective commerce if cleared of most of the Navy moorings. The available depths in this area are sufficient for ships drawing 30 feet, 6 feet in excess of the depth required for destroyers. This area could be released for commercial use and the moorings relocated in the lower harbor where there is space for 14 destroyer moorings with available depths of not less than 24 feet. The existing naval moorings are now used only infrequently.

66. Should the Navy Department agree to the relocation of these moorings the anchorage requirements in the harbor would be met for present naval and commercial navigation and for prospective commercial navigation without further improvement.

67. Navy Department plans as late as May 1940 did not contemplate the use of Charleston Harbor by a greater number of vessels than can now be accommodated. Until the plans have been changed there is no apparent justification for the proposed improvement. However, in view of the present national-defense program, including authorization for a material increase in the number of naval vessels, it is possible that the Navy Department may find it advantageous to base large numbers of the Atlantic Fleet at Charleston somewhat as hoped for by local interests and expressed in their brief setting forth

the advantages of Charleston Harbor as a naval base for cruisers, destroyers, and submarines. In this case additional anchorage areas satisfactory to the Navy Department should be provided as a measure of national defense.

68. The most desirable location for a naval anchorage is in area B. The southerly half of this area, designated as area B–1, would probably be adequate for naval needs for some time, and could be enlarged at such time as found necessary. It could accommodate 20 cruiser moorings, allowing a swinging circle of 1,500 feet diameter each, or could be utilized for both cruisers and destroyers. The removal of 15,100,000 cubic yards of material would be required to secure a net depth of 30 feet, at an estimated first cost of $1,812,000, with $12,500 annually for maintenance.

69. *Water power.*—No question of water power is involved in the proposed improvement.

70. *Other special subjects.*—It is not practicable to coordinate the improvement desired with projects for terminal construction, land reclamation or other work so as to reduce the cost to the United States.

71. *Conclusion.*—Existing anchorage grounds in Charleston Harbor are adequate for existing naval and commercial navigation and are adequate for any expansion in commercial navigation that can be foreseen at this time provided existing naval moorings are relocated within the harbor. Additional anchorage grounds may become essential at a later date to meet increased naval needs and should then be provided as a measure of national defense.

72. *Recommendation.*—In view of the fact that the latest information received from the Navy Department is to the effect that that Department does not desire additional anchorage area in Charleston Harbor it is recommended that none be provided at this time.

READING WILKINSON,
Major, Corps of Engineers,
District Engineer.

[First endorsement]

OFFICE, DIVISION ENGINEER,
SOUTH ATLANTIC DIVISION,
Richmond, Va., September 9, 1940.

To the CHIEF OF ENGINEERS, United States Army:

1. The district engineer has used a unit price of 8 cents per cubic yard for dredging in areas A, AA, C, C–1 and C–1A where the use of pipe lines up to 6,000 feet in length is involved. It is believed that the estimated cost of dredging should be increased to 10 cents per cubic yard in these areas.

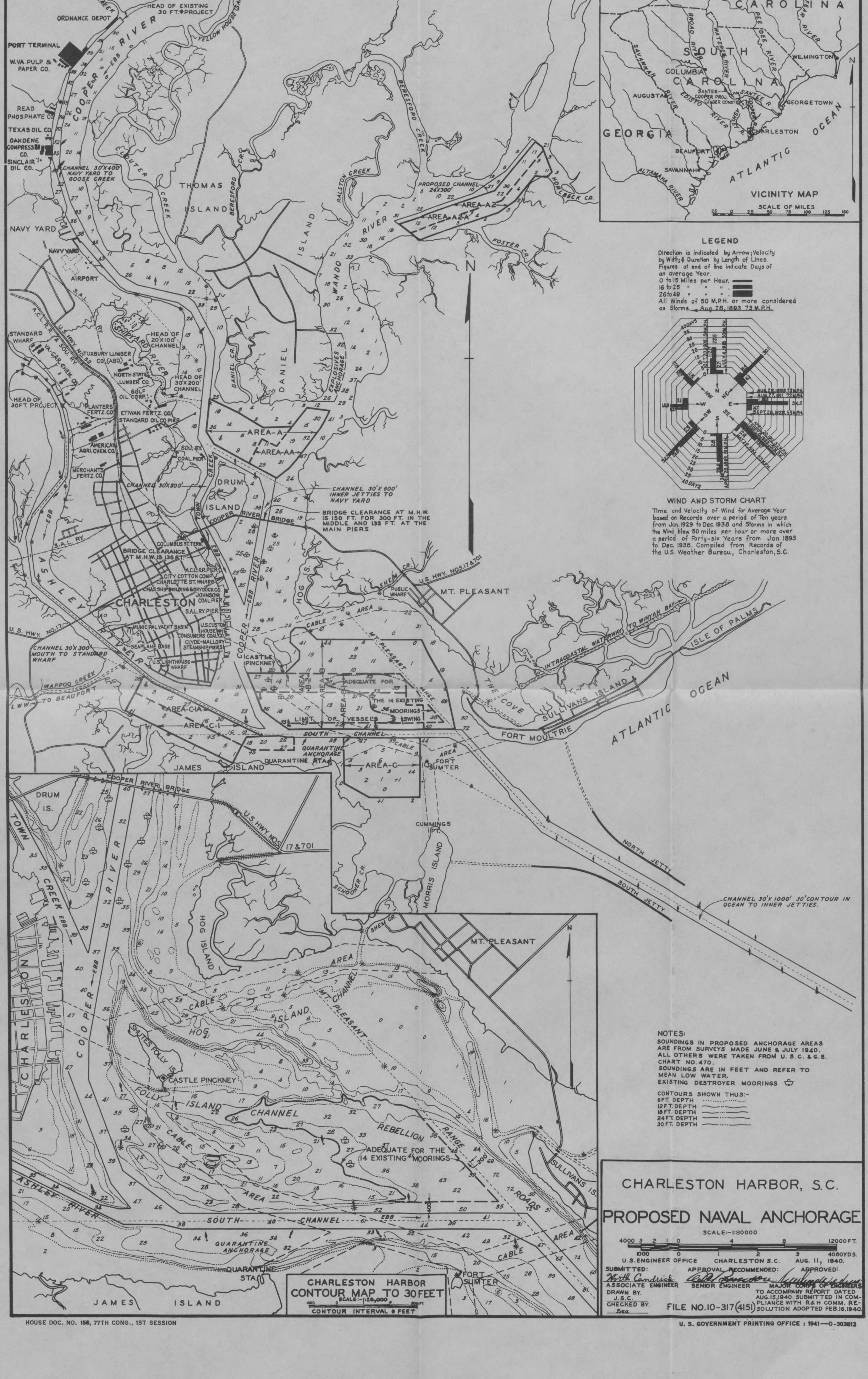
2. With the above exceptions, the views and recommendations of the district engineer are concurred in.

JARVIS J. BAIN,
Colonel, Corps of Engineers,
Division Engineer.

○

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



LEGEND

Direction is indicated by Arrow; Velocity by Width; & Duration by Length of Lines. Figures at end of line indicate Days of an average Year.

0 to 15 Miles per Hour.
16 to 25 " " " .
26 to 49 " " " .
All Winds of 50 M.P.H. or more considered as Storms. Aug. 28, 1893 73 M.P.H.

WIND AND STORM CHART

Time and Velocity of Wind for Average Year based on Records over a period of Ten years from Jan. 1929 to Dec. 1938 and Storms in which the Wind blew 50 miles per hour or more over a period of Forty-six Years from Jan. 1893 to Dec. 1938. Compiled from Records of the U.S. Weather Bureau, Charleston, S.C.

NOTES:

SOUNDINGS IN PROPOSED ANCHORAGE AREAS ARE FROM SURVEYS MADE JUNE & JULY 1940. ALL OTHERS WERE TAKEN FROM U. S. C. & G. S. CHART NO. 470.

SOUNDINGS ARE IN FEET AND REFER TO MEAN LOW WATER.

EXISTING DESTROYER MOORINGS

CONTOURS SHOWN THUS:-
6 FT. DEPTH
12 FT. DEPTH
18 FT. DEPTH
24 FT. DEPTH
30 FT. DEPTH

CHARLESTON HARBOR, S.C.

PROPOSED NAVAL ANCHORAGE

SCALE:-1:80000

4000 3 2 1 0 4 8 12000 FT.
1000 0 1 2 3 4000 YDS.

U.S. ENGINEER OFFICE CHARLESTON S.C. AUG. 11, 1940.

SUBMITTED:
Worth Candrick
ASSOCIATE ENGINEER

APPROVAL RECOMMENDED:
SENIOR ENGINEER

APPROVED:
MAJOR CORPS OF ENGINEERS

DRAWN BY.
J.S.C.
CHECKED BY.
Bea

FILE NO. 10-317 (4151)

TO ACCOMPANY REPORT DATED AUG. 15, 1940. SUBMITTED IN COMPLIANCE WITH R & H COMM. RESOLUTION ADOPTED FEB. 16, 1940.

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